K21U 2090

Reg. No. : .....

Name : .....

III Semester B.Sc. Degree (CBCSS – Sup./Imp.) Examination, November 2021
(2015-'18 Admissions)
COMPLEMENTARY COURSE IN MATHEMATICS
3C03MAT – PH : Mathematics for Physics and Electronics – III

Time : 3 Hours Max. Marks : 40

SECTION – A

All the first **4** questions are **compulsory**. They carry **1** mark **each**.

1. Verify that $y = \sec x$ is a solution of $y' = y \tan x$.
2. Check the linear independence of e^{2x} and xe^{2x}.
3. Define unit step function $U(t - a)$.
4. Examine whether $f(x) = \sin x + \cos x$ is odd, even or neither odd nor even.

SECTION – B

Answer **any 7** questions from among the **5** to **13**. These questions carry **2** marks **each**.

5. Find the integrating factor of $(x^2 - 2x + 2y^2)dx + 2xydy = 0$.
6. Solve $y' = 1 + y^2$.
7. Represent the family of all circles through the origin and tangent to the y-axis in the form $f(x, y, c) = 0$.
8. Solve $y'' + 4y' + 4y = 0$.
9. Using the definition, find the Laplace transform of $2t + 3$.

P.T.O.

10. Find the inverse Laplace transform of $\frac{1}{s(2s+1)}$.

11. Find a_n of the Fourier series of $f(x) = x + x^2$, $-\pi < x < \pi$.

12. Examine whether $f(x) = \sin x + \cos x$ is odd, even or neither odd nor even.

13. Verify that $u = e^x \cos y$ is a solution of the two dimensional Laplace equation $u_{xx} + u_{yy} = 0$.

SECTION – C

Answer **any 4** questions from among the **14** to **19**. These questions carry **3** marks **each**.

14. Solve the initial value problem $y' = -2xy; y(0) = 1$.

15. Solve $y'' + 4y' - 5y = 0$, $y(0) = 1$, $y'(0) = 1$.

16. Solve $(D^2 - 2D + 1)y = e^x$.

17. Using convolution, find the inverse Laplace transform of $\frac{1}{(s^2+1)^2}$.

18. Find a solution $u(x, y)$ of the equation $u_x + u_y = (x + y)u$ by separating variables.

19. Find the Fourier Cosine series of $f(x) = \pi - x$, $0 < x < \pi$.

SECTION – D

Answer **any 2** questions from among the **20** to **23**. These questions carry **5** marks **each**.

20. Show that the equation $(3x^2y + e^y)dx + (x^3 + xe^y - 2y)dy$ is exact and solve it.

21. Find the second order homogeneous linear differential equation for which x^3 and $x^3 \ln x$ are solutions.

22. Solve using Laplace transform $y'' - 3y' + 2y = 4e^{2t}$, $y(0) = -3$, $y'(0) = 5$.

23. Find the two half range expansions of $f(x) = x$, $0 < x < 2$.